NIGERIA

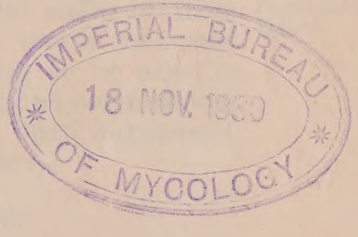
ANNUAL REPORT

ON THE

AGRICULTURAL DEPARTMENT

FOR THE YEAR

1929.



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Staff.

Mr. O. T. Faulkner, C.M.G., was in charge of the Department throughout the year. The sanctioned staff of European officers remained unaltered though the personnel was considerably changed. The Department lost the valued services of Mr. K. T. Rae, who retired on pension after twenty years service in Nigeria. Mr. Rae, who conducted the first experiments in cotton-growing in the Zaria Province in 1911, has been largely instrumental in extending the growth of Allen long-staple cotton throughout the Northern Provinces. His place has recently been filled by Capt. J. R. Mackie, one of the first post-war recruits of the Department. Mr. A. G. G. Hill, Botanist in the Northern Provinces, having accepted a transfer to Mauritius as Senior Geneticist, has been succeeded by Mr. C. B. Taylor who, though possessing special botanical qualifications, joined the Department as Superintendent of Agriculture only last year. Mr. G. H. Jones, Mycologist, resigned on being offered a mycological appointment by the Egyptian Government. It is not proposed, for the present at any rate, to fill the vacancy so created. Mr. D. H. Brown remained seconded to the Imperial College of Tropical Agriculture, Trinidad; while Mr. G. W. Lines, also was seconded for Educational work in Nigeria. The health of officers generally has been good.

Agricultural Conference.

The Second West African Agricultural Conference was held in the Gold Coast during October–November. Seven officers of this Department attended. In addition to officers of the four British West African Colonies, there were also present Mr. F. A. Stockdale, C.B.E., Agricultural Adviser to the Colonial Office and Mr. H. C. Sampson of Kew. Both these gentlemen visited Nigeria after the Conference. The opportunity thus afforded of consultation with these experts was much appreciated by the officers with whom they came into contact.

Produce for Export.

Nigeria in common with the rest of the world suffered from a precipitate fall in the value of practically every one of her raw exportable products. In spite of this it is gratifying to be able to record that the output under all the principal items has been almost a record one, and in some cases has actually never been surpassed. The following table will demonstrate this at a glance:—

EXPORTS OF NIGERIA, JANUARY–DECEMBER.

	1925.	1926.	1927.	1928.	1929.
Cocoa (Tons)	44,704	39,099	39,210	49,163	55,236
Cotton (Cwt.)	132,724	179,315	99,546	74,956	117,173
Decorticated Ground-nuts (Tons)	127,226	126,799	90,770	103,161	145,379
Palm Kernels (Tons)	272,925	249,100	257,206	246,638	251,477
Palm Oil „	128,113	113,267	113,240	127,111	131,846
Shea Products „	7,032	6,990	3,047	9,301	6,852
Tin Ore „	9,293	10,561	10,926	13,070	15,130

It should be observed that the output of tin ore cannot be regarded as altogether divorced from agriculture, since the very considerable labour force employed is fed upon the surplus production of the country which would otherwise be available for export in another form.

American Cotton in Northern Provinces.

The purchases of American cotton for export for the season 1929–30 are equivalent to about 35,000 bales of 400 lb. nett, which is not far short of the record season of 1925–26, when 37,356 bales were exported. There is little doubt that this total would have been exceeded had it not been for the low and falling price which obtained throughout the buying season. Thus, whereas in 1925–26 the price was 2½d. per lb. of seed-cotton at Zaria, the corresponding figure this season was 1⅝d. in November falling subsequently to 1⅕d. The season was exceptionally favourable to the crop, as the rains were copious and prolonged, while there was no threatening of food shortage. A very considerable proportion of the crop in Sokoto, estimated at twenty-five *per cent.* has been held up, either for a rise in price or for disposal locally during the rains; while the movement of cotton northwards to supply the needs of the local weaving industry has been much above normal, owing to the low price ruling for export.

EXPORTS OF AMERICAN COTTON FROM THE NORTHERN PROVINCES.

TABLE NO. 1.

Year.	Bales.	Price.	Year.	Bales.	Price.
1915–16	121	1¾d.	1922–23	11,224	2½d.
1916–17	433	1¾d.	1923–24	15,683	4d. falling to 3d.
1917–18	855	2½d.	1924–25	27,996	3d.
1918–19	2,248	2¾d.	1925–26	37,356	2½d.
1919–20	3,568	3¾d.	1926–27	16,659	1⅝d. to 1⅜d.
1920–21	5,405	4½d.	1927–28	16,316	2⅝d. falling to 2½d.
1921–22	9,883	2d.	1928–29	24,686	2½d. falling to 2⅛d.
			1929–30	34,284*	16/10d. falling to 12/10d.

* Estimates based on purchases of seed cotton.

The amounts purchased in the different parts of the cotton area in the Northern Provinces, during each of the last six years were as follows:—

COTTON PURCHASED FOR EXPORT

(IN BALES OF 400 LB. NETT WEIGHT OF LINT).

TABLE NO. 2.

		1924–25.	1925–26.	1926–27.	1927–28.	1928–29.	1929–30*.
Zaria:—	Bauchi Line ...	4,433	5,456	2,504	1,578	2,786	3,025
	West and North	5,385	5,398	2,494	1,832	1,850	2,280
	South	143	220	246	139	244	310
Katsina Emirate	South	10,205	15,336	9,011	7,261	9,800	15,221
	North	2,240	1,783	143	915	1,880	2,105
Sokoto Province	... ...	2,516	6,177	1,488	3,607	7,069	10,189
Kano Province	... ...	1,531	1,642	237	518	357	425
Niger Province	... ...	1,543	1,344	536	466	471	728
Total	... ...	27,996	37,356	16,659	16,316	24,457	34,283

* Subject to revision.

Individual Areas.

It will be noticed that the expansion of the cotton growing industry in Sokoto has now continued without a check since the sudden drop in 1926–27, and there is no reason, given reasonable prices, why steady progress should not be maintained. The most promising areas are portions of the Rima valley near Isa and Sabon Birni, and the Zamfara valley. It is possible that a ginnery in the latter locality will be found necessary in the near future. A small quantity of American cotton seed will this year be distributed near Nguru, in Bornu, with a view to encouraging cotton growing in the North Bedde area which is served by the new Kano–Hadeija railway.

Maintenance of quality.

There is little doubt that the general quality of the American crop has this season been below average, especially in Sokoto Province, where deterioration in this respect was noticed even last year. For this reason the seed for the whole of Sokoto Province for next season will be supplied from the Southern Katsina area. That trouble of this kind would be experienced in the Sokoto Province was foreseen as long ago as 1920 when the Deputy Director made an extensive tour through this area and reported that the indigenous cotton (*G. punctatum*), known locally as "Labai", was superficially similar not only in its herbaceous habit but also in the character of its lint to the Allen variety (*G. hirsutum*). This similarity renders the detection of admixture in the seed-cotton an extremely difficult matter for those engaged in grading at the markets. The cotton is clean but lint length has decreased and the quantity of immature cotton has been very noticeable in consignments offered for sale. This latter characteristic is likely to be a perennial source of trouble in the northern parts of Sokoto where the rainy season is unduly curtailed. The Botanist's selection "D" has this year yielded as well as the existing commercial strain, while its quality and high ginning percentage have been maintained. It has been decided to multiply this type still further. To this end about forty-five tons of seed have been given to farmers in the area set aside for seed propagation in Southern Katsina, from which some 700 tons of seed should be available in 1931 for general distribution. If expectations as to the rates of multiplication are realised it should be possible to supply all the American cotton growing areas with the improved seed in 1932.

Future breeding of American Cotton.

As a result of the Botanists' efforts to produce further improved strains of cotton, they now have three or four strains which appear to be at least as good as strain "D". These are being tested on a field scale and may eventually prove to be superior to anything hitherto evolved. In the meantime multiplication of sub-strains of "D" at Maigana and Daudawa is being continued, in order to ensure a constant supply of pure seed for distribution. Some of the newly-introduced exotic cottons are promising and further tests on the best of them will be conducted this year.

Empire Cotton Growing Corporation.

The seed farm maintained by the Corporation at Daudawa is yearly becoming of increasing importance for the maintenane of a supply of improved cotton seed for the Northern Provinces. As described in my report for last year the function of this farm is the propagation of pure strains of cotton after leaving the hands of the Botanist in order to increase their bulk sufficiently to warrant their issue to farmers in a circumscribed cotton growing area. The area selected for this purpose is the district of Dan-Ja in the Katsina Emirate. This year 392 acres have been under cotton at Daudawa in addition to other farm crops which are grown in rotation. The cotton grown has consisted exclusively of the Botanists' strain "D", which represents a distinct advance in quality upon the bulk crop of the Northern Provinces. The average yield of 284 lb of seed-cotton per acre, while only a moderate crop for land devoted expressly to cotton growing, is considerably in excess of that generally obtained by farmers in the Northern Provinces, whose first attention must *de rigeur* be devoted to their food crops. An additional 200 acres of land has been cleared at Daudawa during the year. Cultivation is done partly by motor tractors and partly with implements drawn by cattle but mainly by hand. The capital charges and upkeep of motor tractors render their use relatively expensive. Green manures are largely relied upon for keeping up the fertility of the farm, but an endeavour is also made to attract as many Fulani cattle owners as possible to kraal their herds on the land during the dry season on account of the value of the resulting

manure. No artificial fertilisers of any sort are used. The output of seed from the farm ginned at the Corporation's own ginnery at Daudawa amounted to some thirty-five tons.

Seed distribution.

Owing to the low price of cotton, the demand for seed for the 1930–31 season is very slack. It is anticipated that there will be a reduction of twenty-five *per cent.* as compared with last year. It does not, however, follow that the area of cotton planted will fall in proportion, as considerable quantities of seed will be available for growers as a result of seed cotton used at home for hand-spinning. The relatively low prices ruling in the ground nut trade this season will also tend towards an increase in the acreage under cotton on lands far removed from the railway which are capable of growing either crop.

Mixed Farming.

The study of the problems arising out of our attempt to introduce mixed farming and cultivation by means of cattle has been continued. The progress made has been so encouraging, that we can now regard the system as having almost passed out of the experimental stage. In studying a problem of this sort many experiments have to be conducted to test small points which at first may seem unimportant but which may ultimately determine the success or otherwise of the scheme. As an example one may quote the question of the size of ridges and spacing in the row. When using hand labour the ridges were always made at least 3′ 6″ apart, but when ploughs are employed for the purpose, it is found more convenient to adopt 2′ 6″ as the standard. It became necessary, therefore, to experiment in order to ascertain whether this modification would affect the yield. The results have varied from year to year but it appears that the smaller ridges are quite satisfactory provided that the number of plants in the row is increased in inverse proportion. It has also been found that cross cultivation of the growing crop is a practical proposition in certain cases. This will still further reduce the amount of hand-labour required for weeding. Information is being accumulated as to the most economical dressing of farm-yard manure and the best time to apply it to different crops. The question of economics is receiving very close attention. The figures so far obtained are not yet final, but they all go to show that the system is sound from the financial point of view. On the light soil of Kano the use of cattle effects a saving of sixty *per cent.* in the cost of actual cultivation. At Samaru where the soil is much heavier and apt to become water-logged the saving is not so great; but even so, after allowing for depreciation of the bullocks at the rate of twenty-five *per cent.* per annum, and adding every possible item of expense, there is still apparently an appreciable saving, without taking into consideration the value of the manure, which is one of the greatest advantages to be derived from the system. Among the problems which are still being investigated are the production of a green fodder crop for the dry season, the possibility of growing and harvesting a leguminous fodder crop before planting cotton, and the possibility of improving the wild leguminous plants and grasses as a source of fodder. These are points which will in all probability take some years to work out in their entirety. It is most encouraging to record that the two farmers at Samaru who embarked on mixed-husbandry on their own farms with the aid of a loan have had a successful season, although locally it was a difficult year climatically and guinea-corn yields were generally poor. These men appear to be quite satisfied and have been able to refund a portion of their advances. One of their neighbours, a man who already owns several head of cattle, and four farmers at Maigana, have voluntarily come forward and expressed a desire to start the system on their own farms. At Kano, the Bichi Colony which was started last season, appeared for a time to be doing well, but at the end of the season it

was found that there had been a misunderstanding and that the farmers were not free men farming for their own profit as we supposed, but were retainers of the local District Head and were farming the land for his benefit. With the assistance of the Emir of Kano and the Acting Resident, whose active support has been greatly appreciated, the situation has now heen satisfactorily adjusted. The District Head offered the farmers complete freedom to farm the land for thier own profit on the condition that they ceased to be in any way dependent upon him. It was very gratifying to find that one of these farmers was sufficiently satisfied with the system to elect to become independent. Two other farmers in the neighbourhood have also decided to commence the system on their own farms this season. Similar colonies are being started at Dawaki and Taura. At the latter place there is a nucleus of men who were previously tenants on our own farm. The necessary money for the purchase of bullocks and implements for all these farmers has been advanced as loans by the Kano Native Administration which, throughout, has been extremely helpful.

Stock Farm Shika.

Mr. Anderson the officer appointed to take charge of the Stock Farm at Shika arrived in May. There was so much work to do in preparing the farm and completing the buildings that so far he has only been able to undertake preliminary work in the investigation of the problems with which he has to deal. Two bulls and thirty-three cows of the white Fulani breed were purchased in February. A preliminary survey of the mineral dificiencies in natural pastures and consequent causes of "pica" has been made. Other factors which bear upon the problem of improvement of the breeds of cattle in the country are now under investigation. A further forty-six head of white Fulani cows and fifty head of young stock of the same breed have recently been purchased. The latter are to be used for an experiment, which must occupy several years, designed to ascertain the effect of different methods of feeding upon the rate of growth, period between successive calvings, milk production, age of maturity, etc.

Cattle Breeding at Samaru.

The cattle of the Shuwa breed, mentioned in last year's report, have all remained at Samaru, but as soon as accommodation is ready most of them will be transferred to the Stock farm. Owing to the losses which occurred when the cattle first arrived from Bornu, due to the effects of inoculation and exhaustion, at the end of the first year there was a slight decrease in numbers, but last year we were able to record an increase of sixteen *per cent.* and we now have a large number of calves of both sexes of registered parentage which will furnish useful material for future work. Of these, four bulls and nine heifers have recently been taken into the breeding herd. Evidence is accumulating to show that the improved conditions under which the herd is maintained are tending to increase the rapidity of growth and to hasten maturity. The milk records of the cows have been regularly kept. Three cows have given a yield of over 3,000 lb. in one lactation, the best being 3,432 lb. in 365 days. The health of the cattle has been excellent except for a recurrence of "Kirichi" (*Streptothricosis*) a skin disease which causes the infected animals to lose condition and in very bad cases to waste away. Several different forms of treatment have been tried but none of them has been very successful. Dipping with an arsenical dip seems to be the only real cure. With the installation of a dipping tank at Shika we hope to be able to get rid of this trouble completely in the near future.

Irrigation.

It has this year for the first time been possible to achieve a measure of continuity at the Irrigation Farm at Kworre which has resulted in a more complete study of its problems than had hitherto been possible. The Marabawa Bank was quite successful in

controlling the amount of flood water entering the irrigated area; but there was difficulty in getting the water off the land at the end of the season. This is aggravated by the fact that the surplus water from the Shalla river which discharges into the enclosed area cannot be impounded to any great extent, as the dam across the lakes would probably burst if the height of the escape weir was raised to any considerable extent. By reducing the level of the water in the lakes as much as possible during the dry season and still further controlling the amount of flood water which enters the area, it is hoped that this difficulty will be completely overcome. If it is possible to establish favourable conditions inside the bank which the farmers can rely upon to recur every year, the whole scheme will undoubtedly be a great success. Already, much more of the irrigated land is being farmed than was the case at first while our own experience shows that the yields of rice are much greater than those which can be obtained by the native farmer outside the bank. Wheat, onions and sweet potatoes are successfully grown as dry season crops. Quite a good yield was also obtained from guinea corn grown in dry season, but the crop suffered severely from the attacks of small birds.

Rice Mill.

The position with regard to the rice mill is very promising indeed. Last season only sixty-six tons of paddy were bought at a price of 6d. per lb. This season 322 tons had been purchased to the end of February, 1930 at an average price of ·42d. per lb. We anticipate that the total purchases will be over 400 tons. Milling has not yet started as the parboiling plant is not quite completed but this is only a question of a week or two. This plant has been installed as a result of the experiments carried out last season when parboiling was found to be necessary in order to avoid excessive breakage of the grains. It is anticipated that a very good sample will be produced this year, which it should be possible to sell without difficulty at a good profit.

Groundnuts.

The problem of the improvement of the yield of groundnuts is being dealt with by the Botanist. The question of the labour of harvesting, more especially in the heavier class of soils, which was mentioned in last year's report, is a serious one. In the case of the "erect" varieties it is found that a plough can be used very effectively and that this method is very much cheaper than harvesting by hand. The creeping varieties cannot be dealt with so easily in this way as a large proportion of the nuts is left in the soil. The difficulty at the moment is that the creeping varieties yield more heavily than the erect ones, so that the problem resolves itself into finding an erect variety which will yield as well as or better than the creeping one. The Botanist is confident that he will be able to solve this problem in the near future.

Ginger Extension Work.

Extension work with ginger is a small but not unimportant undertaking which is being very successfully carried out among the pagans of Southern Zaria. Its importance lies in the fact that although this area is traversed by the Eastern Railway no exportable crop whatever has ever been produced there. Last year about six tons of prepared ginger were exported from the area and were actually sold in England at 65s. per cwt. This season thanks to the co-operation of the United Africa Company, Ltd., 11½ tons have been purchased. At the moment we are concentrating on quality. Each lot of ginger before being purchased is carefully graded, the price depending on the grade. If the quality can be kept up to such a standard that Southern Zaria ginger can compete with Jamaican ginger the industry should be on a very sound basis. Experiments are now being conducted to see if the quality can be improved by selection or by the introduction of a better variety. In addition to this the effects of manuring and better cultivation are also being

studied. It is unlikely that the industry will ever be a big one, owing to the labour required to prepare the ginger but it is eminently suited to this particular district, where, from time immemorial, ginger has been grown to supply the very considerable requirements of the ten million people in the Northern Provinces who use ginger for medicinal as well as for veterinary purposes.

Benniseed.

The benniseed industry in the Benue and adjacent Provinces has been developing rapidly during the last few years. The centre of the industry is the Munshi country on both sides of the Katsena River, but it is spreading rapidly in the Donga and Lafia Beriberi areas. The seed from the Munshi area has always been, and still is, remarkably pure, but the trading firms have during the last year or two complained that the crop from the newer areas is being increasingly adulterated by a black seed with a very low oil content. Samples of this inferior type were examined by the Botanist who finds that there are two adulterants namely the seed of *Sesamum radiatum* and that of *Ceratotheca sesamoides*. The Chemist also confirmed that these black seeds contained a lower percentage of oil than the seed of pure benniseed (*Sesamum indicum*). The Superintendent of Agriculture in charge of our station at Yandev is now, with the co-operation of the trading firms, endeavouring to eradicate these undesirable species. The firms are this year paying the same price for all seed but are arranging to exchange pure white seed for adulterated seed for sowing purposes. It has been suggested that next season any samples containing black seeds should be purchased on a lower basis than samples of pure white seed. It is hoped that in this way the desired end will very quickly be achieved especially as the rogues can be easily recognized and eradicated in the field on account of the colour of their flowers which differ from those of the true sesame.

Southern Provinces.

Satisfactory progress can be recorded in field work at all the experimental stations. The information gained is forming a valuable basis for the work of the Department in connection with the development and improvement of native agriculture. A full and detailed account of the work done at the different stations is given in the Annual Bulletin. Visits by local farmers interested in the work of the Department have become more frequent.

Cocoa Industry.

A new development in the cocoa fermenting scheme has been successfully in operation at three of the most important cocoa producing centres where the scheme has been in operation since 1922. It was considered that the time had come when cocoa producers, who had participated in the scheme, should have their own organisation for the collection and disposal of their fermented cocoa. They have been guided in the evolution of their Farmers' Associations into what are practically Co-operative Societies, whose operations are conducted by paid secretaries working under the instructions and supervision of the Societies' officials. At Ife the local Association has been very successful, 106 tons of fermented cocoa having been sold under its auspices; the farmers are well satisfied while the Association has accumulated funds for further development. The Ilesha Association being not so well organised called for closer supervision and more assistance from the Superintendent in charge of cocoa work in the area. Only fifty-one tons were dealt with. At Ibadan an independent body known as the Ibadan Co-operative Planters' Association has disposed of about 400 tons of Grade I cocoa, all consigned direct to New York. The Ondo Cocoa Farmers' Association, being a younger body, is not yet in a position to assume responsibility for independent collection and sales of cocoa. This Association with the help of the Department handled 159 tons of cocoa during the season. Prospects of further development are very good at Ondo. In the limited cocoa producing

centres in the Central and Eastern areas encouragement and instruction in cocoa production have been continued with varying success; only at some centres are the producers sufficiently interested in the cocoa crop to endeavour to improve the quality of their produce. The prospects of cocoa cultivation on an extended scale in those areas are not promising.

Cameroons.

The cocoa fermenting scheme in the Cameroons continues to show very gratifying development. The number of cocoa houses in operation increased from nine to twenty-eight and the amount of cocoa handled from 104 to 195 tons. Good prices were obtained for the fermented cocoa. Indeed, the scheme has found so much favour that all requests to participate could not be met.

Palm-oil Presses.

The mechanical aspect of palm-oil production has continued to engage attention. Exhaustive trials of different types of presses and different processes of extraction have been conducted by the Chemists, who are in charge of this branch of our work. The hand-press process has been brought more closely into line with the needs of small producers by means of devices for the reduction of labour to a minimum. Substitutes have been found for some of the more expensive accessories previously recommended, while durability of the presses has been exhaustively tested by their daily use at Moor Plantation. It has been proved that the type of press now recommended will stand up to great deal of hard wear—a fact which is doubtless due to the sound quality of the constructional material which has throughout been regarded as a matter of primary consideration.

The result is that the cost of the press is higher than was originally anticipated, though not apparently too high entirely to inhibit its adoption. Widespread demonstrations have been carried out by the Chemists and Superintendents of Agriculture, with the result that the demand for presses in the Eastern Provinces has shown an increase which points to an extended use of the press. At the end of the year eighteen presses were in use, of which eight had actually been purchased by native producers. The number of intending purchasers is steadily increasing. Successful demonstrations have been carried out in the Western Provinces, but it is not anticipated that there will be a big demand from this quater. A modification of the "Eastern Provinces" process increased the efficiency of the press in dealing with the comparatively poor fruit of the Western Provinces, but yet the efficiency of the press method as compared with the native is not so marked as to convince the majority of producers of its advantages. So far only three presses have been sold in the Ibadan and Abeokuta Provinces. In other areas where the business is in the hands of professional hard-oil makers, the press does not appeal, since the percentage of hard oil obtained by the local method is at least as great as that of the soft oil obtained by the press, while the difference in present prices between the resulting products would not warrant a change to the hand-press. Laboratory work has been pursued hand in hand with these press trials for the purpose of checking the purity of the resulting product and also of tracing the losses which occur in the various residues with the view of designing means to circumvent such losses. Certain problems have arisen in this connexion which still await elucidation. Were it possible to establish on an economic basis modern palm-oil factories with a ninety-five *per cent.* efficiency in oil extraction in each of the principal oil producing areas the whole position would of course be entirely altered, while a greatly increased output of oil would result.

Replanting of Palm Groves.

Yield recording has been continued on all Palm Grove Replanting Experiments described in last year's report with the exception of two small series in the Okigwi district which have

been abandoned on account of the lack of interest shown by the owners. Three new series have been commenced, two at Azumini and one near Calabar but these will serve as demonstrations only, for it is considered that existing experiments will supply adequate data from which the value of thinning and replanting may be assessed. The mean yields from the "bush plots" and "cleared plots" for 1928 and 1929 are given in the following table:—

					Yield of bunches per acre.	
					1928.	1929.
					Lb.	Lb.
Akpabuyo A ...	6 plots, each	1 acre,	in bush	... ...	2,081	2,145
	5 do.	do.	cleared	... ...	3,043	4,231
Akpabuyo B ...	6 do.	do.	in bush	... ...	2,388	1,828
	5 do.	do.	cleared	... ...	2,550	3,307
Akpabuyo C ...	5 do.	do.	in bush	... ...	1,086	1,002
	4 do.	do.	cleared	... ...	1,464	2,664
Ikparakwa A ...	4 do.	½ do.	in bush	... ...	2,120	3,058
	3 do.	do.	cleared	... ...	3,150	4,696
Ikparakwa B ...	4 do.	do.	in bush	... ...	2,428	2,535
	3 do.	do.	cleared	... ...	3,030	2,897
Azumini	5 do.	do.	in bush	... ...	1,410	2,704
	4 do.	do.	cleared	... ...	1,844	2,531
Aba A	5 do.	1 do.	in bush	... ...	457	697
	4 do.	do.	cleared	... ...	1,035	2,148
Aba B	5 do.	do.	in bush	... ...	1,401	1,748
	4 do.	do.	cleared	... ...	2,259	3,007
Aba C	5 do.	do.	in bush	... ...	1,333	1,456
	4 do.	do.	cleared	... ...	1,399	2,653
Orlu	4 do.	½ do.	in bush	... ...	1,053	1,130
	3 do.	do.	cleared	... ...	1,559	1,846

The mean increase in the 1929 yields over that for 1928 for all bush plots is approximately 250 lb. per acre as compared with approximately 850 lb. for all cleared plots. The increase in the case of the bush plots is of no great significance as it is almost entirely due to the behaviour of two of the ten series. It is probable that the bush plots of these two series (Azumini and Ikparakwa A) contained an abnormal number of young bearing palms the yield of which naturally increases with age. A substantial increase in the yield of the cleared plots is recorded from all series with the exception of Ikparakwa B. While the mean increase of 850 lb. per acre is in part due to young palms coming into bearing for the first time, and to that increase in yield of immature palms which would have occurred even under bush conditions, it seems fairly certain that it may be attributed mainly to the response of young palms to their improved environment of the last two years. The solitary exception to the general trend of yield in the cleared plots is of interest. In this series (Ikparakwa B.) almost all palms are tall and past their prime. Many were cut down in 1929 as they were shading the planted seedlings excessively. The remainder are apparently too old to respond to treatment, consequently slight loss in yield has resulted. It may confidently be expected that this loss will be more than compensated for when the young palms commence to bear. In the meantime the plots remain reasonably productive. In addition, it may be noted that in all cases the mean yield per tree on cleared plots exceeds, and usually considerably exceeds, that on

bush plots. In general these experiments, even at this early stage, show that improvement of normal palm bush can be effected without even a temporary sacrifice of yield, and that a substantial immediate increase may be secured if the land contains a fair number of immature palms, since these respond most readily to treatment. Naturally the full value of grove re-planting will not be realised until the seedling palms (which have been planted to secure an economic density and to replace old trees) come into bearing.

Small Palm Plantations.

Additional requests for assistance in establishing small plantations are still being received. During the year thirty-five plantations totalling 115 acres have been commenced. Of those established last year one has been abandoned by its owner and two are receiving but scanty attention. The remainder, especially those at Azumini, Ikparakwa and Oron are progressing favourably. These plantations, which are usually sited on land which carried but few self-sown palms, will form in a few years' time, demonstrations of the value of planted palms if the owners will continue to provide the small amount of labour necessary for their maintenance. Departmental assistance was confined to the supervision of lining out, holing and planting except in those cases where the site of the plantation rendered it particularly valuable as a demonstration. In these instances, as for example in the Abak and Ikot Ekpene Districts where no other demonstration plots exist, a small amount of labour was supplied during the initial stages. All plantations are regularly visited by Agricultural Officers for some encouragement is necessary to induce owners to persevere in the maintenace of their plantations (an entirely new conception to them) during the all important but unproductive first five years. Communal ownership of land forms an obstacle to the wide extension of these activities though difficulties may diminish when the benefits of palm plantations become apparent; yet it seems probable that for many years to come ownership of plantations will be largely confined to men who have acquired individual rights to the land. From experiments at the Umuahia Station it has been found that young palms benefit by being interplanted with annual crops. Intercropping, therefore, is being practised by the Department on certain small demonstration areas. It is very gratifying to find so many individuals anxious to establish small plantations for there is no doubt that the example will be widely followed, especially when the plantations come into bearing, thus providing a real demonstration of the benefits and advantages of plantation methods. These small groves will certainly be far more effective from the point of view of demonstration than numerous little plots planted around native courts by Government. It is also anticipated that the formation of small plantations will stimulate the use of machinery to deal with the increased production. An additional advantage is that these plantations are being made on land which, not being well suited for ordinary farming purposes, might otherwise be entirely non-productive.

Large Plantations and Power Presses.

No factories have hitherto been erected under the Government subsidy scheme though one firm is endeavouring to obtain leasehold areas for plantations. There is no doubt that such plantations would serve as excellent purpose by demonstrating to the people of Nigeria the great possibilities of the soil under enlightened management. The mills operating on the plantations would also provide a ready market for fresh fruit produced in the immediate vicinity. Good progress is being made with the development of the large plantation at Ndian in the Cameroons; the young planted palms promise well. Selected seed of the best varieties of palm from the Agricultural Station at Calabar have been supplied for planting at Ndian.

Palm breeding.

As a result of the Botanists' work, "selfed" palm seedlings from selected trees in the Calabar plots are becoming available for planting out at our experimental stations. These palm plots will in time provide most useful information as to the possibilities of the Nigerian oil palm. It is practically certain that the result of this breeding and selection work will be the production of superior oil palms, but what standard of excellence it may be possible to attain remains to be proved.

Improved Ishan Cotton.

Last year an innovation was made by selling improved Ishan cotton seed at ½d. per lb. instead of distributing it free of charge as is done in the case of the common variety. Some sixteen tons of Improved Ishan seed were disposed of in this way, while a further five tons were issued free of charge. The total export (1928–29) of Improved Ishan lint derived from the crop grown from this seed was 921 bales, giving a return of forty-four bales per ton of seed. It appears that the policy of making this nominal charge for Improved Ishan seed has been fully justified both in the checking of wastage (for one ton of native seed distributed free of charge produces on the average approximately only twenty bales), as well as in educating the farmer to appreciate the value of the new type. Prices ruling during the 1928–29 season were 2½d. per lb. (falling to 2d. in May) for first grade Improved Ishan, the premium over second grade native cotton being ¾d. per lb. throughout the season. Of the Improved Ishan seventy-five *per cent.* of the exported crop was of first grade compared with 0·3 *per cent.* for ordinary cotton. The satisfaction given by the new cotton was reflected in the keen demand for seed in 1929. The whole of the seed produced at Meko was disposed of, some 103 tons being sold at ½d. per lb. while seven tons were issued free to Meko farmers for multiplication purposes. Ishan cotton has completely replaced Native in many areas. The history of the exports of Ishan cotton is as follows:—

1926–27	...	... A few bales produced experimentally at Moor Plantation.
1927–29	...	... 48 bales.
1928–29	...	... 921 „
1929–30	...	... 6,000 „ (estimated).

The 1929–30 season has been generally favourable both as regards yield and quality. The percentage of first grade cotton both of Ishan and of Native has been unprecedented. Unfortunately prices, which opened at the very low figures of 1⅝d. per lb. for first grade Ishan and 1⅛d. for second grade Native cotton, have since fallen steadily. Premia for staple have also narrowed, while throughout the seaon first grade Ishan has commanded only ½d. per lb. more than second grade ordinary cotton. These low prices, coming as they do at the extremely critical period when the majority of producers were giving the new cotton a trial for the first time, are to be deplored. It is difficult to gauge what the effect will be on the future production of Ishan cotton. In spite of a premium of the order of sixty *per cent.* over second grade native, the farmers who grew Ishan cotton this year must have had a grievous disappointment, for the price given for their crop is considerably lower than that obtainable for the ordinary indigenous cotton last year. That this unfortunate state of affairs is entirely due to external economic factors can hardly be appreciated by the farmers, especially in those areas which produced only Ishan cotton this year. It is not unlikely that, as a consequence, the 1930–31 season may be adversely affected. The one mitigating circumstance, however, is to be found in the fact that the prices of all kinds of produce for export have fallen, while there has been an actual rise in the relative value of Ishan cotton as compared with the ordinary indigenous variety. Despite the low prices, the current crop of

Ishan has come in freely though ordinary cotton is being held up for use doubtless in the home spinning and weaving industry. The purchases to the end of March, 1930 are aprroximately 3,550 bales of Ishan and 510 bales of indigenous cotton.

The season in the Southern Provinces has turned out more favourable from a climatic point of view than appeared probable at one time. Indeed some excellent yields of cotton have been recorded at Moor Plantation, as will be seen from the following figures:—

Ishan Cotton after Mucuna green-manure ...	1,140 lb.	of seed-cotton per acre.
„ „ interplanted through ground-nuts	1,000 „	„ „
„ „ interplanted through yams ...	883 „	„ „

Such yields as the above would be considered remarkably good in any part of the world, obtained as they have been without the aid of artificial manure or fertiliser of any kind.

Rotational Green Manuring.

For the past eight years at Moor Plantation, and for six or seven years at the other stations in the Southern Provinces, most of the land has been farmed continuously under a system whereby the sole restorative treatment of the soil has been confined to the use of leguminous green dressings. At Moor Plantation a four year rotation has been followed consisting of yams, cotton, groundnuts and maize with an annual green dressing preceding or following the main crop in each case. Two cycles have now been completed on four ten acre fields farmed under this rotation. The mean yields in pounds per acre are as follows:—

	Yams.	Cotton.	Groundnuts.	Maize.
1st cycle 1922–25 ...	7,291 lb.	162 lb.	1,088 lb.	1,992 lb.
2nd „ 1926–29 ...	7,582 „	202 „	1,308 „	2,016 „
Increase in yield during 2nd cycle	291 lb.	40 lb.	220 lb.	24 lb.

Note:—The yields of cotton refer to seed-cotton.
„ „ groundnuts refer to undecorticated nuts.
„ „ maize refer to dry grain.

A three year rotation which involves mixed cropping and a "whole season" green manure has been followed at Ilorin:—

1st year Maize with guinea-corn interplanted.
2nd „ Yams with cotton interplanted.
3rd „ Mucuna beans (dug in).

The results from the first two cycles are as follows:—

	Yams and Cotton.	Maize and Guinea-corn.	Mucuna.
	1st year	2nd year	3rd year
1st cycle	8,606 lb. 72 lb.	1,247 lb. 378 lb.	(not weighed)
	4th year	5th year	6th year
2nd cycle	10,870 lb. 158 lb.	1,125 lb. 658 lb.	(not weighed)
Increase in yield during 2nd cycle ...	2,264 lb. 86 lb.	122 lb. 280 lb.	—

No special significance is claimed for these general increases in yield at Ibadan and Ilorin, nor, at this stage, can the permanent maintenance of soil fertility be regarded as definitely proven, but it seems fairly certain that reasonable yields over prolonged periods can be obtained by our system of farming, and therefore that the absence of cattle or artificial manures does not, of necessity, condemn the Southern Nigerian farmer to the practice of shifting cultivation. It should be added, however, that the results obtained on the extremely poor land at Benin and Umuahia are not so encouraging. Numerous experiments, designed to give information as to the most efficient and economical practices of green manuring, have been laid down at all stations. Some have already given quite definite results while others have suggested the necessity for yet further experiment in new directions. A detailed summary of this work is in course of preparation and will be published during the current year.

Produce Inspection Eastern Provinces.

The staff of native examiners was increased by thirty-one, bringing the total to 200, thus practically completing the staff required for the extension of the system of produce inspection which was started in 1928. It has been no light task training such a staff of examiners. A great deal of arduous work is entailed in the supervision of so large a staff scattered over a very extensive area with many stations difficult of access. Illness and invaliding of European Inspectors have added to the difficulties, but in spite of that the scheme was worked with gratifying success, gauged by the quality of the produce exported and the favourable opinions expressed by "the trade." Grading was remarkably uniform and well up to the prescribed standards, while there was a very marked improvement in the quality of the produce offered for sale, thus decreasing very much the necessity for detaining produce for cleaning. It is clear that producers now understand the necessity of preparing and offering only produce of the required quality. Former malpractices such as deliberate adulteration and the soaking of palm kernels were of comparatively rare occurrence. The valuable co-operation of the two Advisory Committees has been an important factor in the success of the scheme. The quantities of produce dealt with in the Eastern Provinces during the last two years are as follows:—

	1928.	*1929.*	*Difference.*
Palm oil ...	110,743 tons	117,245 tons	6,502 tons.
Palm kernels	161,576 ,,	163,937 ,,	2,361 ,,
Cocoa ...	1,280 ,,	1,725 ,,	445 ,,

The fines inflicted by the Courts in the Eastern Provinces upon those offering produce for sale, for infringement of the regulations, amounted during the year to £214.

Produce Inspection Western or Lagos Area.

The scheme of inspection has been in operation in the Western Area since 1926 and has continued to work on the whole smoothly and satisfactorily. In some instances African Traders' Unions have employed unofficial examiners in "bush" markets to check the quality of produce offered for sale by the producers. Out-turn reports from the exporting firms indicate the satisfactory quality of produce shipped. In only two cases during 1929 were palm kernels adversely reported on upon arrival at their destination. The percentage of shell and dirt was in these cases only 4·2 and 4·12 respectively. The improvement in palm kernels as compared with 1926 is shown in the following figures for oil content supplied by an exporting firm:—

Average Percentage Oil Content.

1926.	*1927.*	*1928.*	*1929.*
49·72	50·91	50·95	51·04

The condition of palm oil has also been good, "soft oil" having an average impurity content of less than one *per cent.* and "mixed oil" about two *per cent.* Reports on palm oil as received at the bulking plant at Apapa have been very satisfactory and, after cleaning in the plant, samples from the shipping tank have shown a water and dirt content of only 0·5 *per cent.*, even in the case of "mixed oil." The average percentage of defective beans in cocoa shipments as shown by out-turn reports for the 1928–29 crop was less than three *per cent.* There was also an improvement in the quality of the mid-season crop for 1929; forty-two *per cent.* contained less than eight *per cent.* of defective beans as compared with thirty-seven *per cent.* containing less than ten *per cent.* of defective beans in the previous year's crop. At the commencement of the 1929–30 cocoa season the regulations were modified in order that due regard might be given to the degree of fermentation of the beans, so that Nigerian grades might coincide more closely with those recognised in the Home markets. This innovation is achieving the desired end, but it is felt that a smaller margin of safety might be allowed as between the corresponding grades in Nigeria and in the Home markets. This question is being considered by the Western Area Advisory Committee which has continued to give valued advice and co-operation. The quality of cocoa from the point of view of fermentation has shown further improvement. The figures for the first three months of the 1929–30 season, that is October–December, 1929, are as follows:—

Grade I.	Grade II.	Grade III.	Grade IV.
9·4%	28·8%	61·2%	·6%

The estimated crop for the 1929–30 season from the Western area only is 42,000 tons as against 40,939 tons last season. The advantage of graded prices is shown by comparison of the out-turns from the Agege and Ijebu Ode areas: in the former, graded prices have been paid for several years while in the latter a "flat rate" has mostly been in operation owing to the smaller quantities of fermented cocoa available and the habit of mixing well fermented cocoa with inferior qualities. The figures are:—

	Grade I.	Grade II.	Grade III.	Grade IV.
	%	%	%	%
Agege	53·6	42·6	3·6	0·2
Ijebu Ode ...	0·4	28·6	70·7	0·3

The fines inflicted during the year in the Western Area for infringement of the regulations amounted to £939.

Loss of weight in kernels in transit.

Reference was made in last year's Report to the alleged loss of weight in palm kernels in transit. In order to obtain accurate information on this point samples were teken in Nigeria from two bags taken at random. These were analysed locally. The bags were then sealed and were again sampled on arrival in Liverpool. The results are given below. Each figure is the mean of eight determinations.

Date of Shipment.	Moisture content before Shipment.	Moisture content after Transit.	Difference.
	per cent.	*per cent.*	*per cent.*
3rd September, 1929	7·38	6·91	0·47
22nd November, 1929	7·90	6·17	1·73

It should be observed that the first shipment was made during Nigeria's rainy season, while the second occurred in the dry season. The relative results are exactly the reverse of what might reasonably be anticipated, indicating that the losses in weight may be regarded as likely to be typical for kernels shipped

in good condition at any time of year. The figure would obviously be much higher in kernels containing excessive moisture at the time of shipment. In a large number of analyses carried out during the past year on behalf of the Superintending Inspector of Produce, no sample of palm kernels which has been passed as fit for export has been found to have a moisture content in excess of ten *per cent.* It is suggested therefore that in no circumstances could the loss in weight due to drying out on the voyage be more than four *per cent.* Should greater losses be experienced, other causes should be sought to explain them.

Canadian National Exhibition, 1929.

Nigeria joined forces with the Gold Coast in staging an exhibit at Toronto and was represented by the Assistant Director of Agriculture, Southern Provinces. The exhibit was certainly attractive and interesting, and of high educative value to the thousands of sight-seers, but its value as a means of fostering Canadian West African trade unfortunately cannot be assessed so highly. The Canadian National Exhibition is an excellent means of advertisement for manufacturers and retailers, but when it is a question of stimulating trade in raw products, those interested, namely importers and large manufacturers, prefer to seek information and to make enquiries through other channels.

Mycological.

The Mycologist has, among other things, carried out a somewhat exhaustive inquiry into the subject of cocoa fermentation. His results indicate that fermented cocoa will not be entirely free from beans with a purple tint unless the crop is uniformly quite mature when harvested, or unless the fermentation process is unduly prolonged. In actual plantation practice, if all pods are left until fully matured, it is well nigh impossible to avoid a certain proportion of the beans becoming germinated. Such beans are objectionable from the manufacturer's point of view. Again over-fermented beans are dark in colour, brittle and very liable to mould. Thus, complete freedom from the purple tint is not to be expected. The absence of beans classed as "insufficiently fermented" by Produce Inspectors is, however, not difficult to achieve.

In all the different fermentation processes applied, slatey beans were absent from the sample. It is thus concluded that when such beans occur in an otherwise well fermented lot of cocoa, they have been introduced subsequently. A perfectly satisfactory fermentation has been obtained with small quantities of cocoa in baskets, or by mixing in a fermenting box, as well as by transfer from box to box. Exportable dry cocoa from the Ibadan district, as passed by Produce Inspectors, has so low a moisture content that the risk of the development of mould in transit is almost negligible. Evidence was forthcoming that the fungi causing moulding enter the bean through the micropyle, hence the importance of keeping the testa intact.

The study of Bacterial disease of cotton (*Pseudomonas malvacearum*) commonly known as "Angular leaf spot" was continued. A small quantity of cotton seed was exposed in an iron dish to the full rays of the sun daily for two weeks during the early part of June. The temperature throughout the seed reached as high as 60° Cent. at times. This temperature is above the thermal death point of *Pseudomonas.* The seed was subsequently sown for comparison with untreated seed. As it was hoped would be the case, the treatment proved to be entirely efficacious, for whereas no sign of the disease occurred in the plants resulting from the treated seed, forty *per cent.* of the controls developed the characteristic lesions. This method of treatment by exposure to the sun is to be recommended as at once practical and inexpensive. It has been found also to be of use in the Sudan for killing the larvae of the Pink boll-worm.

Yet another inquiry which engaged the Mycologist's attention was a somewhat obscure affection of yams on Moor Plantation. A considerable proportion of the tubers were found on lifting to be very soft and watery in parts. On drying, these diseased parts resembled flour in texture. It was found on microscopic examination that the cell walls were disorganised, the starch grains being free and giving rise to this powdery appearance. Bacteria of more than one type were isolated from the diseased tissue, but nothing definite can yet be stated as to the probable cause of the appearance of this disease nor as to the best method of preventing its recurrence.

Botanical.

Plant breeding has been confined to Cotton, Oil Palms, Groundnuts and Edible Beans. An account of the Cotton investigation, at present incomplete, will be included in the 1930 bulletin. Trials of several strains of cotton have failed to produce a rival to the Improved Ishan now being grown by the farmers in the Western Provinces; hybridisation has been employed to determine whether it is practicable to combine the excellent agricultural characters of this cotton with the more valuable lint of another Ishan strain. Improvement by hybridisation is of necessity a slow process, as several seasons must elapse before a better cotton, if one is obtainable, can be established by this method. The routine work in connection with the provision each year of a supply of pure Improved Ishan seed for the Meko multiplication area has been proceeded with. During the early years this renewal of seed supply is of vital importance in the maintenance of the quality of the Improved Ishan as the main crop is exposed to cross-fertilisation owing to its being grown in farms side by side with the unimproved indigenous cotton. Pure Improved Ishan seed from Moor Plantation will be sown over the whole of the Meko area this coming season to provide seed for general distribution in 1931. Some 200 lb. of Ishan seed were recently supplied to the Compagnie Cotonniere Congolaise for trial in the Belgian Congo. An account of the Department's plantation of oil palms at Calabar, where selective breeding has been carried out is included in the Annual Bulletin for 1929. The yields recorded, over a period of six years for the palms of certain of the Calabar types, compare favourably with those given for Sumatra. At present little is known concerning inheritance in the oil palm. As a result of the examination of the Calabar palms certain tentative suggestions have been made with regard to the inheritance of important fruit characters. These suggestions provide a basis for further investigations. Plots of plantation palms are now being established on the departmental farms with seed from the best of the Calabar palms. These plots will enable the inheritance of yield of the Calabar selections to be tested, while simultaneously the various types will be tested against each other. Further, these plots will provide a future source of selected seed.

Selective work on edible beans has been commenced and is directed to the investigation of the cover crop *cum* local consumption question. A cover crop from which a yield of readily saleable beans can be harvested for local use is obviously a more attractive proposition to the farmer than one from which no direct economic return is obtainable.

Entomological.

Investigations into the suitablility of selected Ishan cotton for the Ilorin Province were continued this season at Ilorin and Bode-Sadu. The results confirmed those obtained in two previous years work, *viz.* that the indigenous cotton gives a higher yield than the Ishan variety but that the seed cotton from the latter is less stained and, as a result of the premium given by the British Cotton Growing Association, is usually of greater value per acre. The results do not appear to be sufficiently conclusive to warrant the substitution of

selected Ishan for the local Ilorin cotton. The cotton stainer problem has been partially solved by the abandonment of Allen cotton in stations south of the Niger; it is evident now that this variety can only be grown successfully in areas where the dry season sets in early. Stainers have been of little importance on the indigenous cotton at Ilorin during the last three seasons. It is evident that they prefer the seed heads of various cultivated grain crops to the bolls of indigenous cottons. For some years past, considerable doubt has existed as to the vector of the disease of cotton commonly known as "leaf curl." It has been proved recently by Mr. Golding that the virus of this disease can be carried from plant to plant by a small white bug belonging to the family *Aleurodidæ*. Ishan cotton has again been compared with the typical Munshi type of cotton in the Benue Province. This year's results agree with those of the previous season in showing that the improved Ishan cotton does not seem suitable for replacing the type normally grown in that area. The Munshi cotton produces only about half as many flowers as the Ishan but yet by the end of the season about an equal number of bolls are harvested from the two varieties. The Munshi loses very few bolls through shedding while the bolls remaining on the plants escape much of the injury which damages the Ishan crop. In consequence a higher yield of cleaner lint is obtained from the former.

Yam beetle.

In April and May a vast breeding ground of this beetle was discovered along the banks of the Niger and its tributaries between Onitsha and Idah. As yet it has not been determined whether the beetle breeds on the Benue, but it is now evident that the great invasion of beetles which caused something approaching famine in parts of the Benue Province in 1927-28 did not arise from rapid multiplication on the Munshi farms themselves but came from either the Niger breeding ground or some other similar area not yet discovered. The plague was probably due to the excessive flooding of country during several years of rather high water in the Niger. It now seems that it will be impossible to control directly the numbers of the yam beetle.

Locusts.

In September news was received from the French station at Niamey that locusts were approaching the Northern frontier of Nigeria. Later at least one swarm penetrated into the Sokoto and Zaria Provinces. In early December swarms of locusts invaded the country, apparently coming in from Dahomey between Meko and the coast. Since then these insects have penetrated throughout the whole of Nigeria, having been reported from nearly every Province. The species has been determined as *Locusta migratoria migratorioides*, R. and F. Towards the end of the dry season the locusts were concentrated along the middle belt of Nigeria avoiding the thick forest in the south. Breeding has taken place in many localities especially along the Dahomey frontier. Swarms of "hoppers" have appeared recently and every effort is being made to exterminate as many of them as possible. Although much handicapped by the unexpectedness of the invasion, an anti-locust organisation is now in operation and many large batches of "hoppers" have already been exterminated by Political and Agricultural officers who are working in close co-operation. From many sources it has been ascertained that the last important outbreak of locusts in the Southern Provinces occurred about thirty years ago. It is interesting to observe that such widely separated territories as Kenya and Nigeria should, after a comparatively long immunity from locust invasion, each be saddled simultaneously with so serious a problem.

Soil Chemistry.

The new laboratory for soil research at Moor Plantation was under construction throughout the year and was nearly completed. Work has been continued in the old laboratory on a study of matters

affecting soil fertility. It had previously been demonstrated that the determination of the electical conductivity of soil extracts may be used as a method of estimating the relative fertility of soils, provided always that such soils are generally similar in nature and environment. During the past year this line of research has been followed up by determining also the nitrates and soluble calcium contained in the soils under examination. It was found that the specific conductivities were closely correlated with the quantities of these constituents present. These correlations explain why specific conductivity may be, under certain circumstances, an index of soil fertility; they also show that a rise in specific conductivity may be indicative of increased biological activity in the soil. The effects of green-manuring have been studied in considerable detail, but it is impossible at the present juncture to be at all dogmatic as to the extremely complicated actions and interactions which undoubtedly occur, due to the activities of those most important organisms classed collectively as the soil fauna and flora. None the less there are undoubtedly indications that green-manuring, while not only adding a certain amount of easily available plant food to the soil, helps to maintain fertility by what may be termed its tonic effect on the micro-organic soil population. Other experiments on the effect of frequency of cultivation upon nitrification showed, as was to be expected, that frequent cultivation had a definite beneficial effect upon the yield of the maize crop, though the increase obtained was not commensurate with the cost of the additional labour required to produce it, nor was its effect in depleting the reserves of plant food in the soil assessed. At Samaru, near Zaria, the chemical laboratory has been in continuous use, in spite of the fact that the fittings have not even yet been entirely completed. At the beginning of the year the shell of the building and the benches, shelving, etc., were more or less in order. After repeated delays a full and satisfactory supply of water and gas was obtained by November. With the exception of the electrical installation and decoration the main building of the laboratory may be said to be now complete. The lack of electrical facilities is regrettable. Of constructional work, there remains the erection of the ice plant and the building to contain it. The work which was commenced at the beginning of the growing season of 1929 was suggested by the studies of nitrification in soils which have been carried out previously at Ibadan. It consisted in studying the effect of dressings of one, two and three tons respectively per acre of farmyard manure in comparison with that of no manure on guinea-corn planted on fairly exhausted soil. It was arranged to take weekly samples from thirteen plots in this experiment—a double set of treatment plots with their controls—and to follow in the first place the changes in moisture content and nitric nitrogen. It was also intended to follow any fluctuations that might occur in total nitrogen. Lcak of facilities has so cramped this part of the work that insufficient results have been obtained to render comment on them justifiable, beyond stating that the total percentage of nitrogen does not exceed the low figure of 0·05. The figures for nitric nitrogen are the most interesting. A first inspection of them shows that for all plots the amount of nitrogen as nitrate was very low on the 6th May, *i.e.* before any appreciable amount of rain had fallen. Between this date and the 27th May the moisture in the soil rose from 1·5 *per cent.* to 13 or 14 *per cent.*, and the nitric nitrogen gradually increased. In the following month the quantity fell while by the 15th July the level was again very low. This low level was maintained until after the rains had finished.

A detailed study of the figures shows up the fact that although on all plots the nitric nitrogen is very low, it is definitely lower on the manured plots than on the unmanured. This may at first sight appear to be remarkable, particularly as throughout the

season the growth of the crop on any plot was obviously more or less proportional to the amount of manure it received. The probable explanation of this phenomenon is to be found in the fact that the presumed increase in the bacterial population of the soil caused by the addition of organic matter in the form of farmyard manure results in a proportion of the nitrogen, which on the unmanured plots appears as nitrate, being converted into bacterial protoplasm. A more elaborate experiment to test this theory has been designed for the coming year.

Feeding stuffs.

The opening of the Stock Farm at Shika has raised the question of the relative value of the different feeding stuffs available for cattle. The Chemist has collaborated with the Superintendent of Agriculture in charge at Shika by carrying out various analyses. Samples of pasturage taken each month at Shika have been analysed for proteins, calcium and phosphorus. It has been found that even at the best times of the year the available ash constituents are present in far smaller amounts than in normal British pasture grass. The phosphorus and protein contents vary during the season, falling from a maximum during the early part of the rains to a very low level in September and October. All the year round the content of insoluble ash is high, and this is particularly the case after the onset of the dry season. In addition to this, analyses of a number of cattle "licks" have been carried out while the mineral and protein contents of various dry fodders suitable as cattle food have been determined. These analyses are intended to give the Superintendent in charge of the farm the necessary data for calculating rations for a feeding experiment in which the Chemist will co-operate in the near future. In this connection the following have been analysed—bulrush millet, guinea-corn, groundnuts, mucuna, cow-peas and cotton seed prepared in various ways. Beyond noting the superiority in feeding value of mucuna or groundnut hay over pasture grass, no comment on these analyses need be made at present.

Departmental School at Ibadan

A special effort is made, during the three years course, not only to instil the principles of agricultural science and practice but also to build up character. Among the points aimed at are the development of a sense of responsibility and of initiative, together with accuracy of observation and statement. Conduct has on the whole been excellent both in the class-room and in the field. Every encouragement has been given to the observance of the principles of hygiene and sanitation both personal and general. An interesting feature introduced into the second years' course was a tour, undertaken to Kano, Zaria and Ilorin, with the object of allowing the students to see what is being done on the different Agricultural stations situated at those centres, and also of broadening their minds. Each student farmed one-tenth of an acre of land, subdivided into four plots of one-fortieth of an acre, on a four-course rotation. Each plot thus represented one year in the rotation. The plots were well tended and the yields which were calculated per acre were well above average. It is gratifying to record that favourable reports continue to be received of ex-pupils who are now working in the Department as Assistants. It is found in practice that the abilities of these men, as gauged by reports received from the officers under whom they are working, correspond very closely with the opinions formed as the result of standard intelligence tests carried out in the school.

The scholarship entrance examination for the new course due to start in January, 1930, was held at three centres—Ibadan, Calabar and Aba on the 6th of September. The Schoolmaster reports that the general standard of the candidates was below that of the last examination held two years ago. This may possibly be accounted

for by the fact that the value of the scholarship has been reduced from £48 to £36 per annum. Several successful candidates did not take up the scholarships they were offered. Twelve scholars have actually been appointed on probation and four other unsuccessful candidates are at present attending the course at their own expense.

P. H. LAMB,
Acting Director of Agriculture.

Moor Plantation,
Ibadan, Nigeria,
1st May, 1930.